UNIVERSITI TEKNOLOGI MARA

MODIFIED NATURAL RUBBER SOLID POLYMER ELECTROLYTES

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

Solid polymer electrolytes comprise of epoxidized natural rubber (ENR) and methyl-grafted natural rubber (MG) as polymer hosts added with $LiClO_4$ were prepared by solution casting technique. Glass transition temperature (T_g) obtained by using differential scanning calorimetry (DSC) and the ionic conductivity evaluated from bulk resistance (R_b) determined using the impedance spectroscopy point towards the higher solubility of the lithium salt in MG rubber. Moreover, two T_gs are observed for the MG-salt electrolyte system whereas only one T_g is obtained for the ENR-salt system at all salt concentrations. The carboxyl group of the MG is found to have a better solvation capability than the oxirane group of ENR. Ionic conductivities (σ) and dielectric constants (ε') are observed to increase with ascending salt content. The dependency of ε' on salt concentration is more pronounced at low frequencies from 50 to approximately 1.0×10^4 Hz. A power law dependence of ionic conductivity on salt concentration is also observed in which the lower charge carrier mobility in ENR as compared to MG is in good agreement with its lower conductivity. The higher dissolution of lithium salt in MG as compared to ENR is also evident in spectroscopic results by FTIR.

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